

## What is Claimed is

1. A process for separating air in a system comprising a gas turbine,  
5 including a compressor, a combustor and an expander, said expander being coupled to the compressor, a natural gas conversion unit, a natural gas liquefaction unit and an air separation unit comprising the steps of:
  - a) compressing air in a compressor, sending a first part of the air to a combustor and a second part of the air to an air separation unit;
  - 10 b) separating at least the second part of the air in the air separation unit to form at least an oxygen enriched gas and an nitrogen enriched gas;
  - c) sending a first stream of natural gas from a source of natural gas to the natural gas conversion unit and at least part of the oxygen enriched gas to the natural gas conversion unit;
  - 15 d) compressing at least part of the nitrogen enriched gas and sending at least part of the compressed nitrogen enriched gas upstream of the expander; and,
  - e) feeding a second stream of natural gas from the source of natural gas to the natural gas liquefaction unit,
  - 20 wherein the work produced by the expander is used to operate a cycle compressor of a refrigeration cycle of the natural gas liquefaction unit.
2. The process of Claim 1 wherein the second part of the air is compressed to a pressure  $P$  in the compressor and is sent to the air separation  
25 unit to be separated at substantially pressure  $P$ .

3. The process of Claim 1 wherein the expander is coupled to cycle compressor of a refrigeration cycle.
- 5 4. The process of Claim 3 wherein the natural gas conversion unit generates steam which is expanded in a steam turbine.
5. The process of Claim 1 wherein the air separation unit comprises at least two columns and, at least one of which functions at a pressure of at least 8 bar abs.
- 10 least 8 bar abs.
6. The process of Claim 1 wherein a fuel gas from the natural gas conversion unit is sent to the combustor.
- 15 7. The process of Claim 1 comprising deriving steam from the natural gas conversion process, expanding the steam in a turbine and using the energy produced to drive at least one compressor from the group comprising a dedicated main air compressor of the air separation unit, a booster of the air separation unit, a compressor of the air separation unit compressing nitrogen enriched gas, a compressor of the air separation unit compressing oxygen enriched gas, a compressor of a propane cycle of the natural gas liquefaction unit.
- 20 enriched gas, a compressor of the air separation unit compressing oxygen enriched gas, a compressor of a propane cycle of the natural gas liquefaction unit.
8. The process of Claim 7 wherein the electricity generated by the steam turbine is used to power a respective motor for at least one compressor
- 25 steam turbine is used to power a respective motor for at least one compressor

from the group comprising a dedicated main air compressor of the air separation unit, a booster of the air separation unit, a compressor of the air separation unit compressing nitrogen enriched gas, a compressor of the air separation unit compressing oxygen enriched gas and a compressor of a propane cycle of the  
5 natural gas liquefaction unit.

9. The process of Claim 1 where the cycle compressor is a multicomponent refrigeration fluid compressor.

10 10. The process of Claim 1 where the cycle compressor is a propane cycle compressor.

11. An Integrated apparatus comprising an air separation unit, a gas turbine having an air compressor, a combustor and an expander, a natural gas  
15 conversion unit and a natural gas liquefaction unit having conduits for sending air from the air compressor to the combustor and to the air separation unit;

a) a conduit for sending a nitrogen enriched gas from the air separation unit to a point upstream the expander;

20 b) a conduit for sending an oxygen enriched gas from the air separation unit to the natural gas conversion unit;

c) a conduit for sending a first stream of natural gas from a natural gas source to the natural gas conversion unit;

d) a conduit for sending a second stream of natural gas from the  
25 natural gas source to the natural gas liquefaction unit; and

e) means for transferring work from the expander to the air compressor and to a compressor of a refrigeration cycle of the natural gas liquefaction unit.

5            12. The apparatus of Claim 11 wherein the expander is coupled to the air compressor.

13. The apparatus of Claim 11 comprising a conduit for sending natural gas to a natural gas conversion unit and a conduit for sending an oxygen  
10 enriched gas from the air separation unit to the conversion unit.

14. The apparatus of Claim 11 wherein the expander is coupled to the compressor of the refrigeration cycle.

15           15. A process for separating air in a system which comprises the steps of:

i) compressing air in a compressor, sending a first part of the air to a combustor and a second part of the air to an air separation unit;

ii) separating at least the second part of the air in the air separation  
20 unit to form at least an oxygen enriched gas and a nitrogen enriched gas;

iii) sending a first stream of natural gas and at least part of the oxygen enriched gas to a natural gas conversion unit;

iv) compressing at least part of the nitrogen enriched gas and sending at least part of the compressed nitrogen enriched gas upstream of an  
25 expander; and

v) feeding a second stream of natural gas to a natural gas liquefaction unit.

16. A process according to Claim 15, wherein said expander operates  
5 a cycle compressor of a refrigeration cycle of the natural gas liquefaction unit.

17. A process according to Claim 15, wherein said expander is  
coupled to the compressor, the natural gas conversion unit, the natural gas  
liquefaction unit and the air separation unit.

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18. The process according to Claim 15, wherein the second part of  
the air is compressed to a substantial pressure,  $P$ , in the compressor and is  
sent to the air separation unit to be separated at a pressure,  $P$ .

15 19. The process according to Claim 15, wherein said expander is  
joined to the cycle compressor of a refrigeration cycle.

20. The process according to Claim 15, wherein the natural gas  
conversion unit generates steam which is expanded in a steam turbine.

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21. The process according to Claim 15, wherein the air separation unit  
comprises at least two columns, at least one functions at a pressure of at least  
about 8 bar abs.

22. The process according to Claim 15, wherein said process further comprises sending a fuel gas from the natural gas conversion unit to the combustor.

5 23. The process according to Claim 15, wherein said process further comprises the steps of:

- i) deriving steam from the natural gas conversion process;
- ii) expanding the steam in a turbine; and
- iii) utilizing the energy produced to drive at least one compressor.

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24. The process according to Claim 23, wherein said compressor is at least one compressor selected from the group consisting of: a dedicated main air compressor of the air separation unit, a booster of the air separation unit, a compressor of the air separation unit compressing nitrogen enriched gas, a  
15 compressor of the air separation unit compressing oxygen enriched gas, and a compressor of a propane cycle of the natural gas liquefaction unit.

25. The process according to Claim 23, wherein the electricity generated by the steam turbine provides power to a motor of at least one  
20 compressor selected from the group consisting of: a dedicated main air compressor of the air separation unit, a booster of the air separation unit, a compressor of the air separation unit compressing nitrogen enriched gas, a compressor of the air separation unit compressing oxygen enriched gas, and a compressor of a propane cycle of the natural gas liquefaction unit.

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26. The process according to Claim 15, wherein the cycle compressor is a multi-component refrigeration fluid compressor.

27. The process according to Claim 15, wherein the cycle compressor  
5 is a propane cycle compressor.

28. An apparatus for separating air which comprises:
- a) an air separation unit;
  - b) a gas turbine having an air compressor;
  - 10 c) a combustor;
  - d) an expander;
  - e) a natural gas conversion unit;
  - f) a natural gas liquefaction unit,
  - g) conduits for sending air from the air compressor to the combustor  
15 and to the air separation unit;
  - h) a conduit for sending a nitrogen enriched gas from the air separation unit to a point upstream the expander;
  - i) a conduit for sending an oxygen enriched gas from the air separation unit to the natural gas conversion unit;
  - 20 j) a conduit for sending a first stream of natural gas from a natural gas source to the natural gas conversion unit;
  - k) a conduit for sending a second stream of natural gas from the natural gas source to the natural gas liquefaction unit; and

l) means for transferring work from the expander to the air compressor and to a compressor of a refrigeration cycle of the natural gas liquefaction unit.

5            29.    The apparatus according to Claim 28, wherein said expander is coupled to the air compressor.

             30.    The apparatus according to Claim 28, wherein said apparatus further comprises a conduit for sending natural gas to a natural gas conversion  
10    unit and a conduit for sending an oxygen enriched gas from the air separation unit to the conversion unit.

             31.    The apparatus according to Claim 28, wherein said expander is coupled to the compressor of the refrigeration cycle.

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